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14 January 1971

OIM Schedule January-April

Objective Investigate & quantify

(1) ~~Define~~ range of applicability of high pass filtering techniques to operational imagery and provide examples of such filtering of operational images.

(2) Define and fabricate a filter set for use with aberrate imagery.

I. High Pass Filtering

Measure spatial frequency transfer characteristics as a function of object contrast and position using sinusoids bar targets and edges for, at least one, and preferably two filter/source configurations.

A. Generate at three contrast rations (1.2, 1.5, 2) each of the following targets

1. Sinusoid (thru 100 cy/mm), Bar Target (228 cy/mm or better), Edge

2. Select targets from operational material.

B. Manipulate targets A1 and A2 using 4mm 1.1 density and 4mm .8 density filters and a 3.4mm source diameter, 5 replicates.

C. Analysis

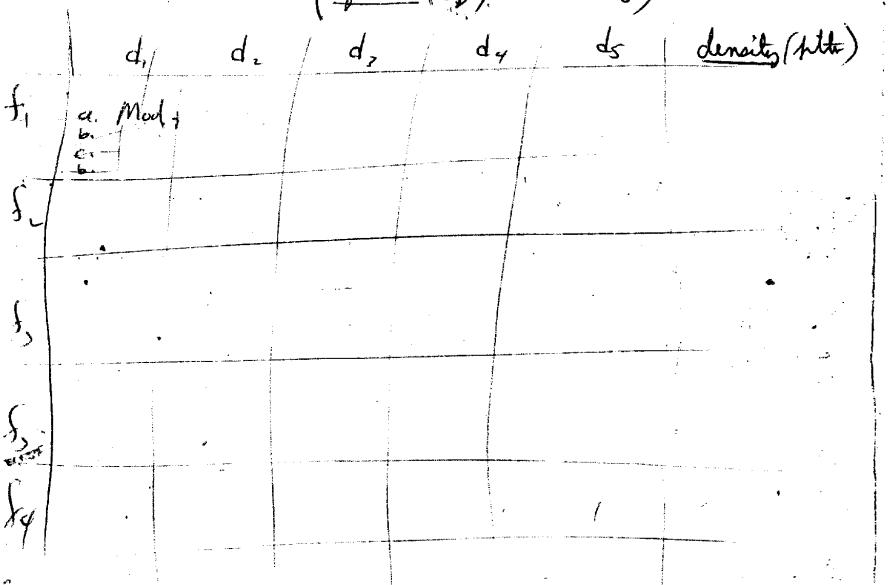
1. Have image traced at APSD include EGA for edge object.

2. Visual quality assessment. Identify any apparent improvements and/or degradations and if possible identify sources.

3. Compare frequency as measured for each contrast and each target type and identify a frequency response and contrast range over which it is valid.

4. Compare empirical model with predictions identify if possible the sources of any discrepancies. Develop model based on filter and source.

(filter (D_i); source D_j)



target (f_{req}, d_i)

Declassification Review by NGA/DoD

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D. Band Pass

1. Select "best" target filter combination and adjust aperture over range 50 1/mm - 200 1/mm.

2. Analyze as in C where applicable in terms of resolution over some range of interest.

3. Evaluate subjective noise suppression.

E. Identify any areas which might benefit from more study, a different approach, modification of optics, etc.

II. In Line Coherent Optical Processing

Establish a set of filters for use in the correction of aberrated imagery.

A. Establish the exposure and processing controls for making precise bleached photographic relief images of controlled relief height.

B. Use high pass filter system to test effects of filter substrate and imaging properties of system to determine whether High Res. Plates introduce any degradations.

C. Design a filter bank consisting of 5 filters for defocus and 5 for linear smear. Examine Ephemeris data to assure that these filters are compatible with some samples of operational imagery.

D. Fabricate any mechanical jigging necessary for experiment.

E. Fabricate filter set described in C.

F. Target Generation for each condition in C both continuous tone and binary.

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Program Plan

To John C.

STAT From [redacted]

Subject Program Plan for week of Jan. 18, 1971

Date Jan. 19, 1971

This plan consists of an outline and discussion of the program performed at

STAT the [redacted]. The effort STAT

STAT includes sponsor personnel and [redacted]

[redacted] personnel.

The objective of the next four months, as noted in the Activity Summary #23, is to evaluate performance of the high frequency enhancement system as it is presently configured. The evaluation is relevant to a measure of system frequency response and correlation to predicted characteristics as well as its

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relevance to improving low contrast information on operational material. Remember that the system is being applied to the low contrast operational material as a pre-filter to viewing. Its frequency response is predicted to be an optimization filter for the low contrast information.

The objective of the next four months also includes initiation and implementation of a filter bank for a specific class of complex filters, especially approximate inverse filters for defocused imagery and imagery with IMC errors.

The objective for the week of 18 Jan. 1971 is directed to the goals outlined above. During this week we will emphasize the high frequency enhancement system

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by performance of optical image manipulation on selected targets. This will, as always occurs during this stage of optical processing, entail a checkout of the optics such as cleaning, alignment and focusing. The configuration of source geometry and filter (transmittance and diameter) will remain as previously used. Some small amount of time will be budgeted for review of selected imagery for OTM input. Of importance to the goals of this program will be time budgeted to prepare special targets for system measurement. This includes a bar target, a sinusoidal target and an edge target. We will define the exact characteristics needed, initiate target fabrication and tracing and program (computer) schedules for

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sine-wave and edge target data reduction. STAT [redacted] personnel will get involved with the computational aspects this week so that the schedule can be defined.

With respect to the phase filter effort, we have a materials (chemical) listing required for the process. This should be reviewed and materials obtained. During the week of 18 Jan. we will also initiate design of filters by determining appropriate scale factors for defocus and IMC errors that are system specific. We will design the filter bank to give flexibility in reconstruction processes, for system imagery as well as other possible inputs.

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[redacted] STAT

Program Outline

Week of 18 Jan, 1971 STAT

Item	Manpower, man-days	Sponsor Lab.	[redacted]
1	Optical image manipulation activity in sponsor laboratory.	1½	2
2	Generation of special targets for measurement of system frequency response. a) Bar target b) Sinusoidal target c) Edge target	1	¼
3	Definition of measurement program, including requirements for edge trace analysis, computer program schedule, data reduction of other targets.		Cat [redacted] STAT deliverable schedule
4	Selection of appropriate reconnaissance imagery for OTM	¼	¼
5	Initiation of phase relief sensitometry by a) design of experiment & procedure; write up for Laboratory use in sensitometry & measure. b) Check out of supply of materials	1	¼ STAT Cat [redacted] deliverable schedule

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6 Design of complex filters utilizing available system specific data and other expected scales for defocus and image blur

Sponsor Lab 1/4

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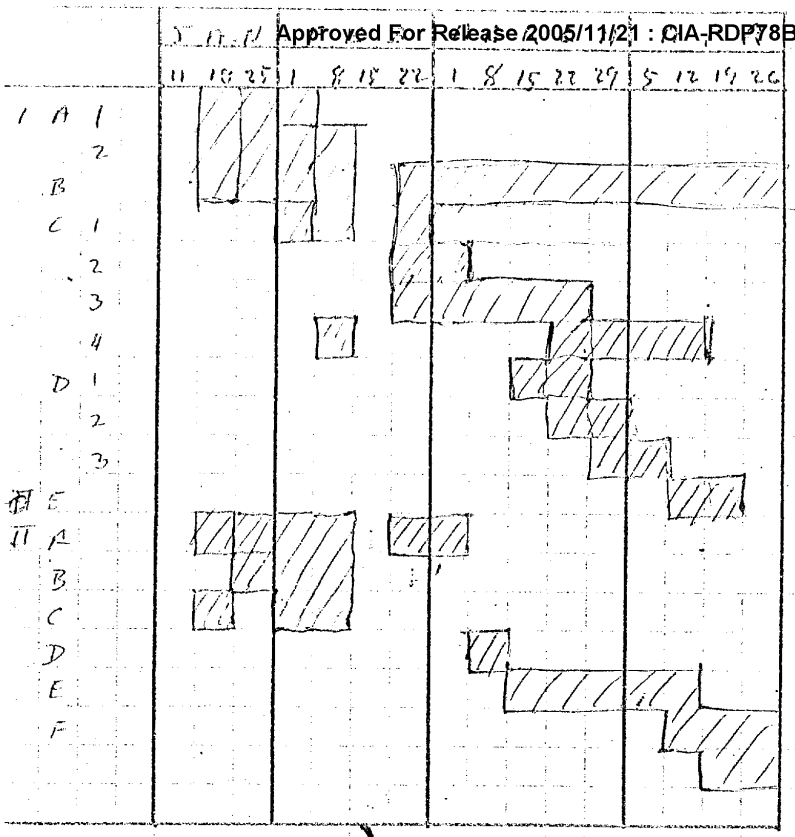

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Possibly [redacted] down this week with Maks – [redacted] on leave

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